CLAIMS

I claim:

1. A method comprising:

irradiating a feature having a size with radiation from a radiation source to form a diffraction pattern;

detecting the diffraction pattern with a detector; and

comparing a feature size identifier from the diffraction pattern with a library of feature size identifiers, each feature size identifier in the library being associated with a known feature size.

2. The method of claim 1 wherein the radiation from the radiation source comprises radiation with a wavelength longer than the feature size.

3. The method of claim 1 wherein the radiation source comprises a helium-neon laser.

4. The method of claim 1 wherein the radiation from the radiation source comprises radiation with a wavelength of about 633 nanometers.

5. The method of claim 1 wherein the feature is transmissive to the radiation, and detecting is accomplished opposite the feature from the radiation source.

6. The method of claim 5 wherein the feature comprises a transmissive window defined by a substantially radiation-opaque microelectronic structure mask substrate.

7. The method of claim 1 wherein the feature is substantially reflective to the radiation, and detecting is accomplished on the same side of the feature as the radiation source.

8. The method of claim 7 wherein the feature is defined into a substantially radiation-opaque microelectronic structure substrate.

9. The method of claim 1 wherein the feature size identifier comprises the positions of maxima within the diffraction pattern.

10. The method of claim 1 wherein the detector comprises a charge-coupled device.

11. The method of claim 1 wherein irradiating a feature comprises irradiating with x-ray radiation or high-energy electrons.

12. A system comprising:

a stage to hold a subject structure that includes a feature with a size to be measured;

a radiation source to emit radiation directed at the feature;

a detector to detect a diffraction pattern caused by the radiation interacting with the feature and to generate a signal representative of at least part of the diffraction pattern; and

a computer coupled to the detector to receive the signal representative of at least part of the diffraction pattern and to compare a feature size identifier of the diffraction pattern with a library of feature size identifiers, each feature size identifier in the library being associated with a known feature size.

13. The system of claim 12 wherein the radiation source is a laser.

14. The system of claim 13 wherein the laser is a helium-neon laser.

15. The system of claim 14 wherein the helium-neon laser emits radiation having a wavelength of about 633 nanometers.

16. The system of claim 12 wherein the detector comprises a charge-coupled device to detect the positions of diffraction intensity maxima.

17. The system of claim 12 wherein the radiation source is an x-ray source.

18. The system of claim 17 further comprising a vacuum enclosure surrounding the radiation source, stage, and detector.

19. The system of claim 12 wherein the radiation source is a high-energy electron source.

20. The system of claim 19 further comprising a vacuum enclosure surrounding the radiation source, stage, and detector.

21. A method comprising:

directing radiation from a radiation source to a structure that includes a feature with a size to be measured;

detecting a diffraction pattern formed by an interaction of the radiation with the feature;

determining a feature size identifier from the detected diffraction pattern; and

determining the size of the feature based on the feature size identifier.

22. The method of claim 21 wherein determining the size of the feature based on the feature size identifier comprises comparing the feature size identifier with a library of feature size identifiers, each feature size identifier in the library being associated with a known feature size.

23. The method of claim 22 wherein the feature size identifier comprises a set of maxima locations within the diffraction pattern.

24. The method of claim 22 wherein the feature size identifier comprises a set of minima locations within the diffraction pattern.

25. The method of claim 22 wherein the feature size identifier comprises an envelope plot.

26. The method of claim 21 wherein the feature has a known pitch.

27. The method of claim 21 wherein determining the size of the feature based on the feature size identifier comprises calculating the feature size.